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The Economics of Hierarchical Organization

by H. DAEMS*

I. INTRODUCTION

Hierarchies have become prominent institutions for the organization of productive activities in modern industrialised economies. Their prominence is not only observable *within* the factory or unit but also *between* the factories and units. Within the factory activities are supervised by bosses and are performed with tools, equipment and materials owned by a third party. Between factories corporate offices have developed that supervise factory and unit management and allocate resources to them. The historical development of hierarchies is reasonably well documented. The economic rationale for their prominence is less well understood. In fact it is sometimes suggested that economics has nothing to say about hierarchies and that sociology should provide an explanation for the hierarchical structure of modern industries. This suggestion is based on the belief that power is a fundamental characteristic of hierarchies and that consequently they should be analysed by a discipline such as sociology that makes power more of a central theme of its research. In this paper I argue that efficiency considerations can also play a critical role in the development of hierarchies. Since efficiency belongs to the domain of economics, it is natural for economists to study and analyse hierarchical institutions. Previous discussions of hierarchies have been hampered by lack of a precise definition of these institutional arrangements. For the purposes of this paper I found it useful to rely on the following characterisation. As institutional arrangements hierarchies have two fundamental characte-

* Departement voor Toegepaste Economische Wetenschappen, K.U. Leuven.

ristics: they centralize ownership and organize supervision. Both characteristics enable the hierarchy to collect the information and to enforce the discipline that both are necessary for planning and coordination. In this way the central issue in the discussion of hierarchy is to show under what conditions centralized ownership and supervision are necessary for planning and coordination. As will become clear later on, these conditions are very fundamental to every economic system because they have to do with the costs of information, negotiation and compliance. In the jargon of economists, such costs are labelled transaction costs. The main argument developed here is that in their search for lower transaction costs modern economies have come to adopt hierarchies.

II. HIERARCHIES IN ECONOMICS

The impact of hierarchies on the performance and the structure of the economy has been undoubtedly remarkable. The historical evidence on economic performance suggests that hierarchical production has enabled the economy to achieve higher rates of output because such production improved organizational efficiency and made the innovation and application of new technologies and resources possible. This is well documented in Chandler's outstanding study *The Visible Hand* (Chandler, 1977). The structure of the economy has changed in three important ways. Control over a variety of productive assets has become centralized in integrated and diversified firms. The separation of ownership and control has created a new group of people: the professional managers who have assumed responsibility for administering the decision-making process. Large multi-level, multi-unit hierarchies have become typical for the organization of work.

Despite the impact of hierarchies on the history of market economies, their very existence and importance remain close to an anomaly in most of neo-classical economic theory. As early as 1937, Ronald E. Coase, in an "often cited but little used" article (Coase's own words; Coase, 1937, 1972), pointed out that if the price system could work without transaction costs there would be no need for a hierarchical institution such as a firm. With zero transaction costs, the economy would in most cases operate as a perfectly decentralized system with few incentives for centralized ownership and managerial supervision. It would be a world without capitalists and without bosses. Indeed with

no information-, negotiation- or compliance costs planning and coordination could be perfectly decentralized because shirking and free-riding would be detected and policed immediately.

The reaction of economists to Coase's fundamental insight has been mixed. Until recently, most neo-classical economists acknowledged Coase's contribution but they have chosen to build models on the assumption that transaction costs are zero. Often, their choice was based on the desire to keep the models tractable by mathematical and geometrical techniques. The consequence, however, is that most of neo-classical economics is unable to deal with the following questions. Why do firms and hierarchies exist? Why do they pursue strategies of integration and diversification? Why did professional managers take over control of the firm in some industries and not in others? Why are some workers paid a piece rate, others a time rate and most a combination of both? When those neo-classical economists refer to the "theory of the firm" they do not refer to a hierachical institution with centralized ownership and managerial supervision but they mean a production function, i.e. a relation between the inputs (capital and labour) and outputs. This "theory of the firm", as it can be found in any textbook on microeconomics, is useful and important because it explains, first, how demand, costs and competitive conditions jointly determine the rate of output, the price and the profit margin and, second, how factor prices shape technology. It can also be adapted to deal with different objectives for the firm but on the whole the theory cannot provide answers to the why questions raised above. Conventional neo-classical economics is a powerful tool for analysing trends in prices, outputs and factor proportions but it is unfortunately not equipped to explain institutional structures and change.

Coase's fundamental insight that firms and hierarchies have no reason to exist when transaction costs are zero remained practically unexplored until the 1970's. Nearly a century after large hierarchies and the so-called managerial revolution became a crucial factor in economic growth, a small group of economists, remarkably enough most of them neo-classical economists, picked up Coase's lead and started to view the emergence of the firm as the result of an institutional innovation to reduce the costs of transacting. Important contributions came from Williamson (1975, 1979, 1981), Alchian & Demsetz (1974), Stiglitz (1975, 1985), Klein, Crawford & Alchian (1978)and from Arrow (1985). These economists demonstrated that transactions costs have a pervasive influence on the contractual relations between the parties

engaged in a transaction. They used their insights to develop a new theory of vertical integration and to lay the foundations for a much needed theory of economic organization. This new work is not only applicable to the study of the business firm but also to the structure of institutions and institutional change in general.

III. DETERMINANTS OF HIERARCHICAL ORGANIZATION

The transaction cost theory argues that hierarchical organizations will have a competitive advantage over decentralized institutional arrangement in one of three cases: (1) to reduce shirking in team production, (2) to prevent exploitation of specific assets and (3) to minimize free-riding when property rights are ill-defined, externalities exist and assets are non-saleable. The typical characteristic of all these cases is that several resourceholders have to plan and coordinate their action and resources in order to deal with complex interdependencies. Such coordination and planning require formal or informal agreements about current and future actions to be undertaken by interdependent parties. Agreements are reached by means of a negotiation process. This process entails costs because information about opportunities, actions and conditions must be collected, compliance with agreements must be policed, time must be spent on negotiations and also because taxes are sometimes levied on certain types of agreements. It will be shown below that in the three cases mentioned hierarchical organization can reduce such transaction costs.

A. *Shirking in team production*

Some economic activities require a very close coordination among workers as to the timing, the amount and the quality of the jobs to be performed and the equipment to be utilized. Without such close coordination, time and resources are lost and maximum efficiency can often not be achieved. In such activities, shirking, i.e. failure by some members of the production team to perform as originally planned, might lead to a loss of income for all members. Shirking in team production is neither accidental nor irrational. The shirker has an incentive to continue such behavior for three reasons. First, most likely he will not bear the full costs of his behavior and the costs of shirking to him will go down as the number of workers in the team increases. Second, if there is no supervision, co-workers will not imme-

diately dectect shirking, especially in large groups. Third, if detected, the co-workers are probably not able to force the shirker to completely refund their current and future loss of income.

To prevent shirking, the team may ask its members to formally agree to a non-shirking contract. In a few exceptional cases and over a rather short period of time when team members are highly motivated and the team is small, such contract may provide an effective protection against shirking. In general, however, the transaction costs, i.e. the costs of information and compliance, will be prohibitively high to fully execute the contract. The close cooperation will break down and the productivity gains of joint production will be lost. Another and much more effective way to protect team production against shirking is to have a manager specialize in supervision of the performance of the team members and consequently to have the team organized as a hierarchy. At first, the reluctance (both economic and psychological) against formal supervision may be great but in the end hierarchical organization will prevail for the following reasons. First, since managers will compete for the right to supervise the team, supervision is likely to be cheaper than shirking (because a shirker effects the income of all). It follows that the potential income for the team members will be greater with supervision than without supervision. This increased income will compensate team members for having to submit to the unpleasantness of supervision. Second, team members no longer have to bear the income loss imposed upon them by the shirking of others. The manager will make sure that the shirker pays the full cost of his shirking by forcing him to adjust his performance to the agreed upon level, or, in an extreme case, by firing him from the team. Firing someone from the team is an effective threat when the costs to the shirker of finding a new job are higher than the expected benefits of shirking on his present job.

It may not appear obvious why team members would allow the manager-supervisor to take the residual part of value added created in the team production and to allow him to become the capitalist while the team members content themselves with a predetermined wage contract. However it is rational for team-members to do so. Indeed, team-members have some but not enough information about the abilities of managers to supervise and direct a team and to optimize the economic capabilities of the team. If team members were paying the supervisor a predetermined wage and took the residual part of value added as their payment they would directly bear the full risk of poor

management. By letting the manager bear the risk they can protect themselves against incompetent managers. Of course workers always bear such risks when the costs of finding an alternative job after the firm collapses are considerable.

In sum, the information and enforcement costs associated with close coordination in teamproduction stimulates hierarchical organization. Such an institution, remarkably enough appears to offer good protection for workers against shirking by co-workers and mismanagement by supervisors. It is consequently not a surprise to observe that highly interdependent activities such as large scale and multi-component assembling are organized in a hierarchical way.

B. *Specific assets*

Additional incentives for centralization and supervision arise because of the existence of specific assets. But in this case the hierarchies develop more *between* factories and units. Specific assets are investments by one party in buidings, equipment, stocks, skills and reputation, the values of which depend to a large extent on the continuing cooperation with a specific other party. If this second party fails to provide the previously agreed upon level of cooperation, the value of the first party's investments may drop considerably because the assets cannot be transferred to an equally profitable alternative without incurring substantial costs. This potential loss is called the quasi-rent (Klein, Crawford and Alchian, 1979). The following examples are useful for illustrating the concepts involved. A wine manufacturer may spend years and a lot of money to develop a high quality reputation for his particular brand. This investment in reputation becomes specific and carries a quasi-rent when the distributor of the wine can degrade the quality. Another manufacturer may build a plant with machines set and workers trained to treat a very specific input. To a certain extent, the value of these investments will depend on the timely delivery of the specific input by the supplier. In both cases, the distributor and the supplier will be tempted to capture the quasi rents on the specific assets by exploiting their position vis-à-vis the manufacturer. When all parties involved in such activities were fully informed about each other's actions and intentions or could costlessly enforce discipline there would be no incentive to appropriate the quasi rents. Under these ideal circumstances the value of specific assets could be efficiently protected by contingent contracts or "if-then" contracts between

fully independent parties. However, centralization and supervision will be more efficient than contracting when information and enforcement costs are high. Centralization of ownership stimulates the parties involved to pursue common interests because all parties share in the joint profits and losses. Supervision reinforces the previous stimulus because deviations from previously agreed upon behavior can easily be detected.

It is generally accepted that three types of assets in particular are subject to high quasi-rents and will give rise to hierarchical organization: brand-name capital, plant and site specific capital and investments in product and equipment specific services and skills. Brand-name capital consists of a firm's accumulated investments in product promotion, product quality and advertising. Such investments are intended to shift the demand curve outward and to generate additional sales. If such additional sales are not forthcoming the investments in brand-name capital are worthless. The value of the brand-name capital is consequently directly dependent on the additional sales that can be generated through the promotion and advertising efforts. Distributors play a crucial role in such efforts by making products available in particular markets and in guarding quality standards. If the distributors fail to make the product available in the market or allow quality to deteriorate after the product has been advertised, the manufacturer stands to lose its investment in the promotion efforts. It can be argued that when information is costly to obtain, distributors have an incentive to try to appropriate the quasi-rent on the manufacturer's brand-name capital. After having made the brand-name investments, manufacturers may not be able to police distributors by threatening to withold business from them because once the damage to the brand-name is done it may be nearly impossible to recapture the losses inflicted on the brand-name capital by legal ways. Manufacturers will be able to avoid being held up by integrating forward into distributing and so they gain hierarchical control.

A similar situation occurs after the manufacturer has committed capital to start up a plant. Many of the investments made in that plant will be site specific. A particular combination of machines can be such that alterations are only possible at great costs. The machines may be set to treat a very specific input. The production technology may require investments in plant specific training of local workers. In such cases the value of the manufacturer's capital is dependent on actions of suppliers and on processors of the plant's output and distributors.

Delays in delivery of materials may idle the plant for weeks. Processors may suddenly require different product specifications and distributors may slow down delivery to the market. Suppliers, processors and distributors have an incentive to use such tactics to appropriate the quasi-rents on the firm's specialized investments. The manufacturer, however, is not powerless against these strategic moves. But in a number of cases, especially when the capital requirements for a plant are huge and the equipment and personnel are highly specific to particular inputs, outputs or distribution channels, the cost of monitoring and recontracting may be too high to police the behavior of suppliers, processors and distributors. Hierarchical organization is to be expected.

In the case of investments in product specific selling services the opportunities for exploitation are reversed. Indeed, when distributors need to make investments in brand specific skills and equipment in order to sell a particular manufacturer's product, the value of these investments becomes dependent on the behavior of the manufacturer. It is unlikely that a wholesaler or distributor will be willing to take the risks of such investments without further protection. As in the case of shirking such protection may be available by setting up a hierarchical organization that integrates manufacturers and distributors.

C. *Free-riding and imperfect saleability*

A final reason for hierarchical organization is free-riding. Free-riding occurs when people obtain the benefits of someone's assets without having to pay the marginal value of those assets. This happens when property rights are ill defined and when externalities exist. By the very nature of its definition it is clear that free-riding can only exist when information and enforcement costs are high. If such costs were neglectable free-riding would be impossible. As industrial history amply demonstrates brand-names and technological knowledge provide substantial opportunities for free-riding. Although property rights over patents and brands are protected by law, it is often quite difficult to detect infringements and to obtain legal enforcement in the courts. Branded and/or patented products will thus stimulate hierarchical organization to reduce free-riding.

Sometimes, free-riding goes together with imperfect saleability of assets. Such assets as production experience and technological and marketing knowledge are difficult to sell. Once information is made

available about such assets it is very difficult to prevent the buyer or others, from using that information to their own advantage without paying for the use of the information.

Licensing provides some legal protection to sellers and buyers of such experience and knowledge but in many cases the legal protection will not be sufficient and the costs too high. In order to fully capture the potential rents on imperfectly saleable assets, centralization and supervision will often be necessary.

IV. CONCLUDING COMMENTS

Alternative economic explanations have been given to account for the hierarchical organization of modern industry. Sometimes it is argued that centralization of ownership and supervision are caused by economies of scale and capital indivisibilities. This explanation is incomplete because it fails to point out what is meant by capital indivisibilities. If such indivisibilities are meant in a very narrow sense and refer to a machine or a building then the joint ownership of this asset could be explained by the desire to share risks. But without transaction costs there would be no reason to organize supervision. If the indivisibilities refer to a combination of machines, buildings and/or activities then without transaction costs, it is impossible to explain why ownership over this combination is consolidated.

The main argument developed here is that the rise of hierarchical organizations can be explained by transaction costs. Such costs are likely to arise when shirking is possible in large teams, when the assets used are highly specific and when opportunities for free-riding exist. Although it is not easy to show precisely that transaction costs have risen considerably over the course of the last hundred years, it nevertheless seems plausible to come to that conclusion. Indeed, the process of industrialization has stimulated large scale team production, made assets more specific and increased opportunities for free-riding. It is consequently not a surprise to observe hierarchies with their centralized ownership and supervision to become more dominant in highly developed economies. However, organizational differences between these countries continue to exist. Some countries such as the United States and Germany appear to rely more strongly on ownership centralization and supervision than others. Often these differences are explained by cultural factors. With the transaction cost theory it is

possible to incorporate these factors in the explanation. Indeed, in countries where culture reduces the temptation to shirk or to behave opportunistically in the face of incompletely specified contracts, the need for hierarchical organization is much lower. In this way the transaction cost theory provides a challenging new perspective for studying differences and changes in institutional structures and in sizes of firms.

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